

WHAT IS CLAIMED IS:

1. A system, comprising:

a customer premise equipment for establishing a DSL connection via a copper line,
said customer premise equipment connecting to said copper line;

5 a DSL access multiplexer, connecting to said copper line, for establishing said DSL
connection with said customer premise equipment via said copper line, said DSL connection
being established between said customer premise equipment and said DSL access multiplexer
with a dynamic transmission rate determined based on the transmission environment; and

a DSL connection optimizer for adaptively optimizing the transmission rate between
10 said customer premise equipment and said DSL access multiplexer by re-initializing said DSL
connection.

2. The system according to claim 1, wherein said DSL connection optimizer
connects to both said customer premise equipment and said DSL access multiplexer and
15 determines to re-initialize said DSL connection based on the connection statistics stored in
both said customer premise equipment and said DSL access multiplexer.

3. A system comprising:

a customer premise equipment for establishing a DSL connection via a copper line,
20 said customer premise equipment connecting to said copper line, said customer premise
equipment establishing said DSL connection with an adaptively optimized transmission rate
determined based on transmission environment and realized by re-initializing said DSL
connection; and

a DSL access multiplexer, connecting to said copper line, for establishing said DSL connection via said customer premise equipment and said copper line.

- 5 4. The system according to claim 3, said customer premise equipment comprises:

a DSL connection optimizer for adaptively optimizing said transmission rate on said DSL connection, said DSL connection optimizer determining to re-initialize said DSL connection based on connection statistics provided by said customer premise equipment.

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5. A system comprising:

a customer premise equipment for establishing a DSL connection via a copper line, said customer premise equipment connecting to said copper line; and

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a DSL access multiplexer, connecting to said copper line, for establishing said DSL connection via said customer premise equipment and said copper line, said DSL access multiplexer establishing said DSL connection with an adaptively optimized transmission rate determined based on transmission environment and realized by re-initializing said DSL connection.

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6. The system according to claim 5, wherein said DSL access multiplexer comprises:

a DSL connection optimizer for adaptively optimizing said transmission rate on said DSL connection, said DSL connection optimizer determining to re-initialize said DSL connection based on the connection statistics provided by said DSL access multiplexer.

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7. A system comprising:

a customer premise equipment for establishing a DSL connection via a copper line,
said customer premise equipment connecting to said copper line, said customer premise
equipment establishing said DSL connection with an adaptively optimized transmission rate
5 determined based on transmission environment and realized by re-initializing said DSL
connection; and

a DSL access multiplexer, connecting to said copper line, for establishing said DSL
connection via said customer premise equipment and said copper line, said DSL access
multiplexer establishing said DSL connection with an adaptively optimized transmission rate
10 determined based on transmission environment and realized by re-initializing said DSL
connection.

8. The system according to claim 7, wherein said customer premise equipment
15 comprises:

a first DSL connection optimizer for adaptively optimizing said transmission rate on
said DSL connection, said DSL connection optimizer determining to re-initialize said DSL
connection based on the connection statistics provided by said customer premise equipment.

9. The system according to claim 8, wherein said DSL access multiplexer comprises:

a second DSL connection optimizer for adaptively optimizing said transmission rate
on said DSL connection, said second DSL connection optimizer accessing connection
statistics provided by said DSL access multiplexer and communicating with said first DSL
25 connection optimizer to negotiate when to re-initialize said DSL connection.

10. A system for a DSL connection optimizer, comprising:

a statistics generator for generating statistical information about transmission environment along a DSL connection between a customer premise equipment and a DSL

5 access multiplexer based on connection statistics;

a feasibility detector for detecting, based on said statistical information, whether there is a potential performance gain by re-initializing the DSL connection; and

a re-initialization determiner for determining when to re-initialize said DSL connection if there is a potential performance gain by re-initializing, detected by said

10 feasibility detector.

11. The system according to claim 10, wherein said statistics generator comprises:

a historical statistics accumulator for generating historical statistics that characterize the past transmission environment defined with respect to a specified time scale and factors;

15 and

a new statistics accumulator for generating new statistics that characterize the current transmission environment defined with respect to a specified time scale and factors.

12. The system according to claim 11, wherein said factor includes signal to noise
20 ratio.

13. The system according to claim 11, wherein said factor includes cyclic redundancy check anomaly count.

14. The system according to claim 11, wherein said statistics generator further comprises:

5 a control mechanism for controlling said time scales and said factors applied in both said historical statistics accumulator and said new statistics accumulator.

15. The system according to claim 10, wherein said feasibility detector comprises:

10 a comparison unit for comparing said past transmission environment and said current transmission environment based on said historical statistics and said new statistics to generate a performance differential margin; and

a potential performance gain detector for detecting a potential performance gain based on said performance differential margin.

15 16. A method, comprising:

establishing a DSL connection between a user and a central office via a customer premise equipment connecting to said user, a copper line connecting to said customer premise equipment, and a DSL access multiplexer connecting to both said copper line and said central office, said DSL connection being established using an initial transmission rate negotiated
20 based on transmission environment detected during line probing;

collecting, by both said customer premise equipment and said DSL access multiplexer, connection statistics that reflect the DSL transmission performance and the transmission

environment along said DSL connection between said customer premise equipment and said DSL access multiplexer; and

detecting, by a DSL connection optimizer based on said connection statistics, whether there is a potential performance gain by re-initializing said DSL connection.

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17. The method according to claim 16, further comprising re-initializing said DSL connection to achieve said potential performance gain.

18. The method according to claim 17, wherein said re-initializing comprises:

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determining whether said re-initializing is to be performed automatically;

notifying said user about said potential performance gain, if said re-initializing is not to be performed automatically;

re-initializing said DSL connection immediately if an automatic re-initialization is to be performed immediately, determined by said determining;

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re-initializing said DSL connection at a specified time if an automatic re-initialization is to be performed at a fixed time, determined by said determining; and

detecting a non-critical time to re-initialize said DSL connection, if an automatic re-initialization is to be performed at a non-critical time; and

re-initializing said DSL connection at said non-critical time.

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19. A method for a DSL connection optimizer, comprising:

gathering connection statistics about a DSL connection between a customer premise equipment and a DSL access multiplexer via a copper line;

generating historical statistics based on said connection statistics to characterize past transmission environment on said DSL connection;

generating new statistics based on said connection statistics to characterize current transmission environment on said DSL connection; and

- 5 detecting a potential performance gain based on said historical statistics and said new statistics.

20. The method according to claim 19, wherein said detecting comprises:

- 10 comparing said historical statistics and said new statistics to estimate a performance differential margin; and
detecting said potential performance gain based on said performance differential margin.

21. A computer-readable medium encoded with a program, said program comprising:

- 15 establishing a DSL connection between a user and a central office via a customer premise equipment connecting to said user, a copper line connecting to said customer premise equipment, and a DSL access multiplexer connecting to both said copper line and said central office, said DSL connection being established using an initial transmission rate negotiated based on transmission environment detected during line probing;
20 collecting, by both said customer premise equipment and said DSL access multiplexer, connection statistics that reflect the DSL transmission performance and the transmission environment along said DSL connection between said customer premise equipment and said DSL access multiplexer; and

detecting, by a DSL connection optimizer based on said connection statistics, whether there is a potential performance gain by re-initializing said DSL connection.

22. The medium according to claim 21, further comprising re-initializing said DSL connection to achieve said potential performance gain.

23. The medium according to claim 22, wherein said re-initializing comprises:
determining whether said re-initializing is to be performed automatically;
notifying said user about said potential performance gain, if said re-initializing is not to be performed automatically;

re-initializing said DSL connection immediately if an automatic re-initialization is to be performed immediately, determined by said determining;

re-initializing said DSL connection at a specified time if an automatic re-initialization is to be performed at a fixed time, determined by said determining; and

detecting a non-critical time to re-initialize said DSL connection, if an automatic re-initialization is to be performed at a non-critical time; and
re-initializing said DSL connection at said non-critical time.

24. A computer-readable medium encoded with a program for a DSL connection optimizer, said program comprising:
gathering connection statistics about a DSL connection between a customer premise equipment and a DSL access multiplexer via a copper line;

generating historical statistics based on said connection statistics to characterize past transmission environment on said DSL connection;

generating new statistics based on said connection statistics to characterize current transmission environment on said DSL connection; and

- 5 detecting a potential performance gain based on said historical statistics and said new statistics.

25. The medium according to claim 24, wherein said detecting comprises:

- 10 comparing said historical statistics and said new statistics to estimate a performance differential margin; and
- detecting said potential performance gain based on said performance differential margin.